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REMARKS/ARGUMENTS

Reconsideration of this application in view of the foregoing amendments and the following remarks is respectfully solicited.

Claims 1-10, 12-17 remain in this application. Claims 4, 5, 7-10, 13 and 14 are non-elected, and no generic claim has been allowed. Claims 1, 15, and 16 have been amended.

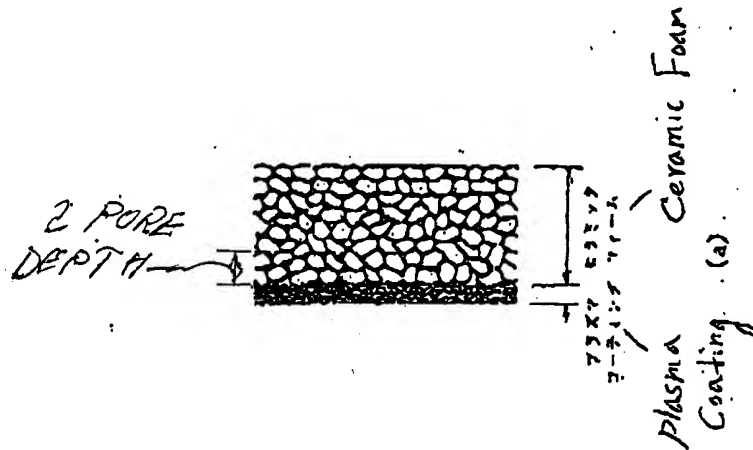
Claim 17 was indicated to be allowable.

The rejection of claim 3 as being indefinite (35 U.S.C. 112) in the recital of "inorganic polymers" is respectfully traversed. The term "inorganic polymers" appears on page 15, line 20 of the specification. The term "inorganic polymers" has a well defined meaning in the chemical arts. See, for example, the enclosed copies of *McGraw-Hill Concise Encyclopedia of Science & Technology*, ed. Sybil B. Parker (New York: McGraw-Hill Book Co., 1984) pp. 911-12; and Gessner G. Hawley, ed. *The Condensed Chemical Dictionary*, 9th ed. (New York: Van Nostrand Reinhold Co., 1977) p. 701.

The rejection of claims 1-3, 6, 12, 15 and 16 as being anticipated by Japanese publication 63-2873 is respectfully traversed. When the very general and unclear disclosure in this Publication is carefully considered it is clear that this publication does not disclose a plasma sprayed coating with uniform interconnected porosity that has penetrated the foam substrate to from about 1 to 5 pore diameters.

The reference publication is very general, and silent or contradictory as to the penetration of the coating into the foam, the nature of the porosity of the coating, and the uniformity of the porosity in the coating.

Reproduce immediately following this sentence is Fig. 1(a) from the reference publication with the translation of the legends and a marking that indicates what a depth equal to two pore diameters into the ceramic foam would be.



Clearly, as illustrated in the above annotated Fig. 1(a) from the reference publication, the coating does not penetrate the ceramic foam. There is nothing in the translation of this reference to suggest that there is or that there should be any penetration of the ceramic foam by the coating. The entire coating, as illustrated, is at most only slightly more than one pore diameter thick. The markings on the right side of Fig. 1(a) that indicate the thickness of the coating show where the core-coating boundary occurs. There is no illustrated overlap between the core and the coating. Claim 2 of the reference recites in pertinent part "...by applying a ceramic coating on the surface of a ceramic foam..." The recital is to a "surface" coating, not to a coating that penetrates the surface.

The penetration of the foam to a depth of about 1 to 5 pore diameters according to the present invention is not provided for an idle purpose. Such penetration is beneficial to bonding and heat transfer, but excessive penetration increases the weight unacceptably. See, for example, your Applicant's specification, pp. 8-10. There is no teaching in the reference concerning the depth of penetration other than what is shown in Fig. 1 and defined in claim 2. There is nothing in this reference to place the penetration at between about 1 and 5 pore diameters. These limits can not be determined from this reference.

The existence of pores in the coatings does not mean that the pores are interconnected. The reference is silent as to whether the pores in the coating are interconnected or not. The very general reference, all in one confusing sentence, to filtering, catalysts, "whose property is changed in the thickness direction", and the improvement of engine heat efficiency, is not clear enough to support the inference that the coatings should or do have interconnected porosity. It is not clear from the teachings of this reference that the very general reference to filtering applies to fluid flow laterally through the coating or longitudinally through the foam core in confinement by fluid impervious coatings

The reference is silent as to the substantial uniformity of the pores. Nothing concerning such uniformity can be inferred from this reference.


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Applicant respectfully requests that a timely Notice of Allowance be issued in
this case.

Respectfully submitted,

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the United States is made up of a series of Federal projects, with the exception of the New York State Barge Canal, which is a state project. Improvement, maintenance, and operation is the responsibility of the Army Corps of Engineers working with Federal funds appropriated by the Congress. [B.B.C.]

Inoculation The process of introducing a microorganism or suspension of microorganism into a culture medium. The medium may be (1) a solution of nutrients required by the organism or a solution of nutrients plus agar; (2) a cell suspension (tissue culture); (3) embryonated egg culture; or (4) animals, for example, rat, mouse, guinea pig, hamster, monkey, birds, or human being. When animals are used, the purpose usually is the activation of the immunological defenses against the organism. This is a form of vaccination, and quite often the two terms are used interchangeably. Both constitute a means of producing an artificial but active immunity against specific organisms, although the length of time given by such protection may vary widely with different organisms. See CULTURE MEDIA; IMMUNITY; VACCINATION. [E.G.SI./N.K.M.]

Inorganic chemistry The chemical reactions and properties of all the elements in the periodic table and their compounds, with the exception of the element carbon. The chemistry of carbon and its compounds falls in the domain of organic chemistry. The boundaries of inorganic chemistry with the other major areas of chemistry are not precisely defined, and it is often a matter of taste as to whether a particular topic is to be included in the field of inorganic chemistry or is to be considered physical or even organic chemistry. Investigations into theoretical inorganic chemistry or the study of problems in inorganic chemistry by quantitative and sophisticated physical methods may be considered either inorganic or physical chemistry quite arbitrarily. In similar fashion, organometallic compounds may be considered to be in the sphere of either inorganic or organic chemistry. To an increasing extent, the inorganic chemist is concerned with problems that once were considered the prerogative of physical chemists, organic chemists, or even biochemists. See BIOINORGANIC CHEMISTRY; CHEMICAL DYNAMICS; COORDINATION CHEMISTRY; GEOCHEMISTRY; NUCLEAR CHEMISTRY; ORGANOMETALLIC COMPOUND; PHYSICAL CHEMISTRY; SOLID-STATE CHEMISTRY. [J.J.K.]

Inorganic photochemistry The study of the light-induced behavior of various metal compounds. The physical and chemical properties of substances are generally altered by the absorption of light. Typical metal compounds have a characteristic number (coordination number) of molecules or ions (ligands) directly bonded to the metal center. For example a six-coordinate compound has the general formula ML_6^{n+} . Many of these compounds are colored, and much interest has been aroused by speculation that some metal compounds could mediate the transformation of solar radiation into useful chemical or electrical energy. See COORDINATION NUMBER.

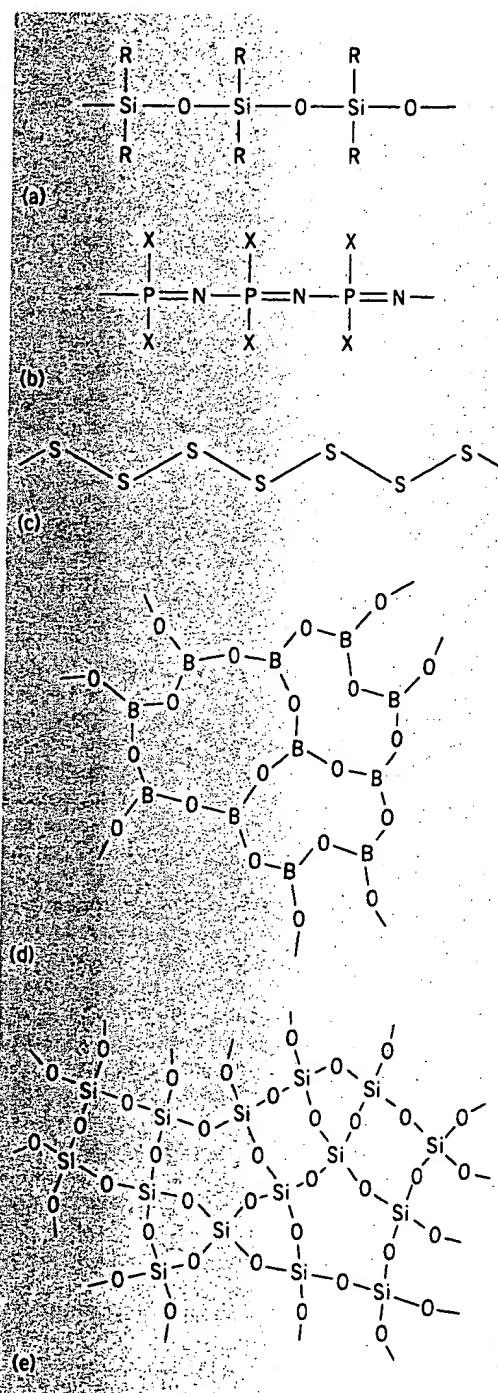
The photochemistry of metal compounds has grown in concert with modern theories of the electronic structure of molecules and of chemical bonding in molecules. Photochemical studies are often designed to probe and test these theories. The range of pertinent studies spans most of the subdisciplines of chemistry and includes or bears on such topics as photo-physics, the development of laser materials, catalysis, photo-synthesis, oxidation-reduction chemistry, acid-base chemistry, organometallic chemistry, metalloenzyme chemistry, solid-state chemistry, and surface chemistry. See CHEMICAL BONDING; CHEMICAL DYNAMICS; COORDINATION CHEMISTRY; LASER PHOTO-CHEMISTRY; PHOTOCHEMISTRY. [J.F.E.]

Inorganic polymer A giant molecule linked by covalent bonds but with an absence or near-absence of hydrocarbon units in the main molecular backbone; these may be included

as pendant side chains. Carbon fibers, graphite, and so forth are considered inorganic polymers.

Some special characteristics of many inorganic polymers are a higher Young's modulus and a lower failure strain compared with organic polymers. Relatively few inorganic polymers dissolve in the true sense, or alternatively, if they swell, few can revert. Crystallinity and high glass transition temperatures are also much more common than in organic polymers. In highly cross-linked inorganic polymers, stress relaxation frequently involves bond interchange. See CHEMICAL BOND THEORY; YOUNG'S MODULUS.

Inorganic polymers can be classified in a number of ways. Some are based on the composition of the backbone, such as

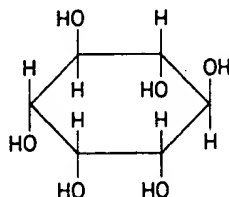


Polymers with varying connectivities: (a) siloxanes, two; (b) phosphazenes, two; (c) sulfur, two; (d) boric oxide, three; (e) amorphous silica, four. (After N. H. Ray, *Inorganic Polymers*, Academic Press, 1978)

the silicones (Si—O), the phosphazenes (P—N), and polymeric sulfur (S—S). Others are based on their connectivity, that is, the number of network bonds linking the repeating unit into the network. Thus the silicones based on R_2SiO , the phosphazenes based on NPX_2 , and polymeric sulfur each have a connectivity of two, while boric oxide based on B_2O_3 has a connectivity of three, and amorphous silica based on SiO_2 has one of four (see illustration).

Among the well-known inorganic polymers are silicones, chalcogenide glasses, graphite, boron polymers, and silicate polymers. See BORON POLYMERS; CHALCOGENIDE GLASSES; GRAPHITE; SILICATE POLYMERS; SILICONE RESINS. [R.A.S.]

Inositol A crystalline, water-soluble alcohol, often grouped with the vitamins. Inositol has the structural formula shown below. Almost nothing is known of its function in enzyme sys-



tems. It is metabolized as a carbohydrate, but its availability is limited in the presence of dietary calcium. There is no evidence of a human requirement for inositol in the diet, probably because a considerable amount is synthesized by intestinal bacteria. Yeast cells and mammalian tissues are capable of inositol synthesis. See CARBOHYDRATE. [F.W.]

Insect control, biological The term biological control was proposed in 1919 to apply to the use or role of natural enemies in insect population regulation. The enemies involved are termed parasites (parasitoids), predators, or pathogens. This remains preferred usage, although other biological methods of insect control have been proposed or developed, such as the release of mass-produced sterile males to mate with wild females in the field, thereby greatly reducing or suppressing the pests' production of progeny. Classical biological control is an ecological phenomenon which occurs everywhere in nature without aid from, or sometimes even understanding by, humans. However, humans have utilized the ecological principles involved to develop the field of applied biological control of insects, and the great majority of practical applications have been achieved with insect pests. Additionally, such diverse types of pest organisms as weeds, mites, and certain mammals have been successfully controlled by use of natural enemies.

Biological control offers several advantages over chemical control. Application costs are minimal and nonrecurring and there are no environmental pollution problems connected with biological control, whereas insecticides cause severe problems related to toxicity to humans, wildlife, birds, and fish, as well as causing adverse effects in soil and water. Biological control causes no upsets in the natural balance of organisms, but these upsets are common with chemical control; biological control is permanent, chemical control is temporary, usually one to many annual applications being necessary. See ENTOMOLOGY, ECONOMIC; INSECTICIDE. [P.DeB.]

Insect pathology A biological discipline embracing the general principles of pathology (disease in the broadest sense) as applied to insects. It refers to human observations and actions concerning the cause, symptomatology, gross pathology, histopathology, pathogenesis, and epizootiology of the diseases of insects; it is concerned with whatever can go wrong or become abnormal in an insect. A diseased insect may be suffering from an infectious disease caused by a microorganism or a noninfectious disease, such as a metabolic distur-

bance, a genetic abnormality, a nutritional deficiency, a physical or chemical injury, or injury caused by parasites or predators.

Insect pathology draws upon and contributes to the general field of microbiology and provides understanding of certain of the biological relationships existing between insects and microorganisms not pathogenic to them. Insect pathology may be viewed as a part of invertebrate pathology and a part of the branch of entomology. Insect pathology finds applications in agriculture, medicine, and biology generally. Microbial control, the use of microorganisms in biological control, is one area of applied insect pathology. Microorganisms are introduced to control insect pests for the protection of humans, animals, and agricultural crops. However, the suppression of disease in beneficial insects, such as the silkworm, honeybee, and ladybird beetle, is also of significant practical importance. See INSECT CONTROL, BIOLOGICAL; INVERTEBRATE PATHOLOGY. [J.D.Br.]

Insecta A class of the phylum Arthropoda sometimes called the Hexapoda. This is the largest class of animals, containing about 750,000 described species, but there are possibly as many as 5,000,000 actual species of insects. Like other arthropods, they have an external, chitinous covering. Fossil insects dating as early as the Paleozoic have been found throughout the world.

Classification. The class Insecta is divided into orders on the basis of the structure of the wings and the mouthparts, on the type of metamorphosis, and on various other characteristics. There are differences of opinion among entomologists as to the limits of some of the orders. The following are considered herein as orders of insects.

Subclass Apterygota

Order: Thysanura—bristletails, silverfish

Subclass Pterygota

Order: Ephemeroptera (Ephemerida)—mayflies

Odonata—dragonflies and damselflies

Blattaria (Dictyoptera)—cockroaches

Mantodea—mantises

Isoptera—termites

Orthoptera—grasshoppers, katydids, crickets, walking sticks, cockroaches, and mantids

Phasmatoptera

Dermaptera—earwigs

Embiidina (Embioptera)—web-spinners

Plecoptera—stoneflies

Zoraptera—zorapterans

Psocoptera—psocids

Mallophaga—chewing lice

Anoplura—sucking lice

Thysanoptera—thrips

Hemiptera—bugs

Homoptera—cicadas, hoppers, aphids, whiteflies, scale insects

Neuroptera—dobsonflies, fishflies, snakeflies, lacewings, antlions

Coleoptera—beetles

Strepsiptera

Mecoptera—scorpionflies

Siphonaptera—fleas

Diptera—true flies

Trichoptera—caddisflies

Lepidoptera—butterflies and moths

Hymenoptera—sawflies, ichneumons, chalcids, wasps, ants, bees

Morphology. Insects are usually elongate and cylindrical in form, and are bilaterally symmetrical. The body is segmented, and the ringlike segments are grouped into three distinct regions, the head, thorax, and abdomen. The head bears the

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Coauthor, Glossary of Chemical Terms



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chloride; polyethylene (linear); polystyrene; polypropylene; fluorocarbon resins; polyurethane; acrylate resins

(b) Thermosetting

elastomers (vulcanized); polyethylene (crosslinked); phenolics; alkyds; polyesters

3. Semisynthetic

cellulosics (rayon, methylcellulose, cellulose acetate); modified starches (starch acetate, etc.)

See also following entries.

polymer, addition. See addition polymer.

polymerase. An enzyme which catalyzes the formation of messenger DNA.

polymer, atactic. See atactic.

polymer, block. See block polymer.

polymer, condensation. A polymer formed by a condensation reaction (q.v.).

polymer, electroconductive. A polymer or elastomer made electrically conductive by incorporation of a substantial percentage of a suitable metal powder (e.g., aluminum) or acetylene carbon black; the proportion used must be high enough to permit the particles to be in contact with one another in the mixture. Polyelectrolytes such as ion-exchange resins, salts of polyacrylic acid and sulfonated polystyrene are electroconductive in the presence of water. Pyrolysis of polyacrylonitrile makes it electrically conductive without impairment of its structure.

polymer, graft. See graft polymer.

polymer, high. An organic macromolecule composed of a large number of monomers. The molecular weight may range from about 5000 into the millions (for some polypeptides). Natural high polymers are exemplified by cellulose ($C_6H_{10}O_5$)_n and rubber (C_5H_8)_n. Proteins are natural high polymer combinations of amino acid monomers. The dividing line between low and high polymers is considered to be in the neighborhood of 5000 to 6000 molecular weight.

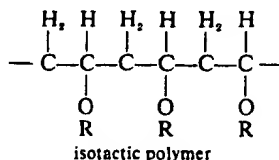
Synthetic high polymers (or "synthetic resins") include a wide variety of materials having properties ranging from hard and brittle to soft and elastic. Addition of such modifying agents as fillers, colorants, etc., yields an almost infinite number of products collectively called plastics (q.v.). High polymers are the primary constituents of synthetic fibers, coating materials (paints and varnishes), adhesives, sealants, etc. Polymers having special elastic properties are called rubbers, or elastomers (q.v.).

Synthetic polymers in general can be classified: (1) by thermal behavior, i.e., thermoplastic and thermosetting (q.v.); (2) by chemical nature, i.e., amino, alkyd, acrylic, vinyl, phenolic, cellulosic, epoxy, urethane, siloxane, etc., and (3) by molecular structure, i.e., atactic, stereospecific, linear, cross-linked, block, graft, ladder, etc. (see specific entries). Copolymers (q.v.) are products made by combining two or more polymers in one reaction (styrene-butadiene). See also cross-linking.

polymer, inorganic. A polymer in which the main chain contains no carbon atoms and in which behavior similar to that of an organic polymer can be developed, i.e., covalent bonding and cross-linking, as in silicone polymers. Here the element silicon replaces carbon in the straight chain; substituent groups are often present, forming highly useful poly-

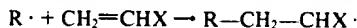
mers. Other inorganic high polymers are black phosphorus, boron and sulfur, all of which can form polymeric structures under special conditions. At present these have little or no commercial significance.

polymer, isotactic. A type of polymer structure in which groups of atoms which are not part of the backbone structure are located either all above or all below the atoms in the backbone chain, when the latter are all in one plane. See polymer, stereospecific.



polymerization. A chemical reaction, usually carried out with a catalyst, heat or light, and often under high pressure, in which a large number of relatively simple molecules combine to form a chain-like macromolecule.

The polymerization reaction occurs spontaneously in nature; industrially it is performed by subjecting unsaturated or otherwise reactive substances to conditions that will bring about combination. This may occur by *addition*, in which free radicals are the initiating agents that react with the double bond of the monomer by adding to it on one side, at the same time producing a new free electron on the other:



By this mechanism the chain becomes self-propagating. Polymerization may also occur by condensation, involving the splitting out of water molecules by two reacting monomers, and by so-called oxidative coupling (q.v.). The degree of polymerization (D.P.) is the number of monomer units in an average polymer unit of a given sample.

Polymerization techniques may be: (1) in the gas phase at high pressures and temperatures (200°C); (2) in solution at normal pressure and temperatures from -70° to +70°C; (3) bulk or batch polymerization at normal pressure at 150°C; (4) in suspension at normal pressure at 60° to 80°C; (5) in emulsion form at normal pressure at -20° to +60°C (used for copolymers). Catalysts of the peroxide type are necessary with some of these methods.

See also polymer, stereospecific; free radical.

polymer, ladder. See ladder polymer.

polymer, low. A polymer comprised of comparatively few monomer units and having a molecular weight from about 300 to 5000.

polymer, natural. See polymer.

polymer, stereoblock. See stereoblock polymer.

polymer, stereospecific (stereoregular). A polymer whose molecular structure has a definite spatial arrangement, i.e., a fixed position in geometrical space for the constituent atoms and atomic groups comprising the molecular chain, rather than the random and varying arrangement that characterizes an amorphous polymer. Achievement of this specific steric (three-dimensional) structure (also called tacticity, q.v.) requires use of special catalysts such as those developed by Ziegler and Natta (q.v.) about 1950.